

Prediction of exposure risk associated with the dynamic behavior of aerosols during dental procedures in dental clinics in the context of the COVID-19 pandemic

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Research Article

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Abstract

Objectives

This study aimed to develop a risk prediction scale for COVID-19, based on an analysis of the dynamic behavior of aerosols generated during dental procedures.

Materials and methods

The dispersion of aerosols during dental procedures performed in six dental clinics was evaluated using standardized photographs. The digital images were processed to analyze the stained area and the dimensions of the drops. A logistic regression model was built with the following variables: ventilation, the distance from the mouth, the instrument used, the area in the mouth to be treated, and the location within the perimeter area.

Results

The variables that were associated with a higher risk of exposure in the prediction scale were a distance of less than 78 cm; improper ventilation; the use of a high-speed handpiece; the location of the patient, operator, and assistant; and, to a lesser degree, the intervention of the anterior region of the mouth. The sizes of a large percentage of aerosolized particles ranged from 1 to 5 μm . The maximum settlement range from the mouth of the phantom head was 320 cm, with a high-risk cut-off distance of 78 cm.

Conclusions

Contamination by disseminating aerosols represents a significant risk for the dental team. Thus, it is advisable to improve ventilation, use extreme biosecurity measures and all the cleaning and disinfection measures.

Clinical relevance

The need to implement new clinical care strategies was evident. The scale is useful for predicting the risk of exposure to the contagion of COVID-19 in the dental office.

1. Introduction

COVID-19 is an infectious disease caused by the coronavirus (Severe Acute Respiratory Syndrome coronavirus 2 [SARS-CoV-2]) and has spread across the worldwide in recent months [1]. The nosocomial transmission of this infection has been reported more recently [2, 3]. The mode of transmission of the disease and the extent of environmental contamination vary depending on the conditions of the environment [4]. To et al. [5] recognized saliva as a reservoir of SARS-CoV-2 in infected individuals; therefore, it is recommended to reduce the number of aerosol-generating procedures (AGPs) during the diffusion phase of COVID-19. Exposure to saliva produced during the majority of the AGPs represents a high risk of contagion in dental schools, clinics, and offices [6-8].

According to the guidelines set by the World Health Organization and various other government agencies for the gradual restoration of health services during the mitigation and control phases of the current health emergency [9, 10], infection in oral health care settings can be transmitted directly through the inhalation of droplets generated while coughing or sneezing, by the exposure of the mucous membrane to infectious droplets, and by indirect transmission through contaminated surfaces. [9-10]. The most probable mode of transmission of SARS-CoV-2 occurs via direct contact when droplets (diameter, $>5 \mu\text{m}$) that do not remain suspended in the air are deposited on to surfaces at a distance of $<2 \text{ m}$ from the individual; contact with these surfaces can contaminate the mucosa of the mouth, nose or conjunctiva [11-12].

Airborne transmission occurs through droplet nuclei (diameter, $<5\ \mu\text{m}$), which contain viral particles. Droplet nuclei can remain in the air for long periods and reach people more than one meter away [13]. Airborne transmission of the SARS-CoV-2 virus may be possible under specific circumstances and in the locations where AGP is performed (during manual ventilation before intubation, intubation, tracheostomy, and open airway suction) [14, 15]. The risk in dentistry is mainly related to the use of high-speed handpieces and ultrasound instruments, which generate aerosols and droplets often mixed with saliva and blood [16, 17].

It is essential to describe the dispersion of aerosols, define the settlement patterns, and develop a scale for predicting the risk of exposure for the spread of COVID-19, based on the dynamic behavior of the aerosols generated during the procedures. The findings of this study are highly pertinent at present, due to the urgent need to define strategies to reduce the transmission of SARS-CoV-2 that causes COVID-19.

2. Materials And Methods

2.1 Spread of aerosols

2.1.1 Location and distribution of experimental units

After receiving approval from the institutional ethics committee (B-CIEFO-074-2020), two dental units were selected in six dental clinics in this study. Phantom heads (Bader, Nigran, Pontevedra, Spain) were assembled in each dental unit and an ANA-4 (Bader) typodont containing 28 teeth was installed in each phantom. The phantoms were placed in two distant areas in the clinics to evaluate the influence of changes in airflow generated within the clinics (Fig. 1).

2.1.2 Aerosol-generating dental procedures

Dental procedures were performed using four aerosol-generating instruments: high-speed handpiece, pneumatic scaler, ultrasonic scaler, and triple syringe (Fig. 2). An expert operator performed the procedures in a standardized way with regard to the dimensions and the time required for the treatment. Four procedures were performed per unit, two in the anterior teeth (one with an open window and one with a closed window) and two in the posterior teeth (one with an open window and one with a closed window), to evaluate the influence of ventilation on the dispersion of the aerosols (Table 1). The operator and the assistant used the recommended personal protective equipment (PPE) comprising a long-sleeved surgical gown with back closure, disposable cap, latex gloves, N-95 mask, eye protector, face shield, and closed shoes.

2.1.3 Collection of samples

A non-toxic concentrated artificial dye diluted 1: 100 in water was loaded into the accessory tank of the dental unit in each clinic. Additionally, artificial saliva was prepared using propylene glycol, USP grade carboxymethylcellulose, and $<5\%$ bivalent cations, which was mixed with artificial coloring until a density of $1.005\ \text{g/ml}$ was obtained. The density was measured using a density meter (DMA 4500, Anton Paar, Hidalgo, Mexico) calibrated at 15.56°C . The colored saliva was poured into the posterior oral area of each phantom head to simulate the natural saliva. The control of aerosol dissemination by gravity deposition was performed using a filter paper placed in plastic Petri dishes (size, $100 \times 25\ \text{mm}$). Four areas (60, 90, 120, and $320\ \text{cm}^2$) within the perimeter of the phantom head were covered in a from the phantom's mouth to obtain the 1256 samples collected of settled aerosols in the six clinics (Fig. 3). The papers were held in position for up to 30 min after the end of the procedure. The average ambient temperature in the clinical areas was 20°C , and the relative humidity was 70%. A 2: 1 air-water pressure ratio was used. The supply pressures for air and water were calibrated at 80 psi and 40 psi, respectively.

2.1.4 Identification of aerosols

The dispersion of the dye on the filter paper was recorded using standardized photographs of the droplets. The photos were taken with a Nikon D5500 camera (Nikon Corporation, Tokyo, Japan) and standardized at a focal length of 85 mm | 6000 × 4000 dimensions | 1/ 125 s | f/ 32 | ISO 200. To improve the detection of the drops settled on the filter paper, the colorimetric image as converted to a fluorometric image using the Adobe Photoshop program (Adobe Inc., San Jose, CA, USA). The digital images were processed to analyze the stained area and the dimensions of the drops using the Image J program (National Institutes of Health, Bethesda, Maryland, USA) in a binary system (Fig. 4). The numbers and sizes of the settled drops were measured in pixels and converted to microns (μm).

2.2 Data analysis

The analyses were carried out using the statistical package STATA 16.9 (StataCorp LLC, Texas, USA). The Microsoft Office Excel 2010 program (Microsoft Corporation, Redmond, Washington, USA) was used for the construction of the databases. The independent variables (Table 2) that showed an association with the “stained area” outcome or biological plausibility were identified to construct the prediction model for the risk of exposure to COVID-19. Normality was determined using the Shapiro-Wilk test. The outcome variable was dichotomized from the median (50th percentile) after performing a logarithmic transformation, whereas the “distance” variable was dichotomized according to the cut-off points established by the maximum discriminatory capacity with the area dyed. The Odds Ratio (OR) values were obtained from the logistic regression model and used to determine the scores of the variables.

3. Results

3.1 Spread of aerosols

One thousand two hundred and fifty-six sites were evaluated within the perimeters of the phantom heads, of which 739 had a greater or lesser degree of aerosol settlement. The sites with the most significant aerosol deposition were at a distance of less than 80 cm, which is where the operator, patient, assistant, and dental unit were located. An inverse relationship was observed between the distance and the settlement of the aerosols. The maximum distance reached by the aerosol was 320 cm, although few reached the accessory areas, such as adjacent units, sinks, auxiliary tables, walls, among others (Fig. 5).

The influence of ventilation on the number of settled aerosols was observed, independent of the location of the dental unit (near or far) from the windows (Fig. 6a and 6b). However, the tendency to decrease the number of aerosolized particles settled during AGPs when performed with the windows opened was evident when the dental unit near the ventilation was evaluated (Fig. 6b). Most of the aerosols generated by the high-speed handpieces were droplet nuclei (between 1 and 5 μm), especially in the dental unit close to the ventilation (Fig. 6c and 6d).

The aerosolized particles generated by the sonic and ultrasonic devices were compared in size. The influence of ventilation on the generated aerosol size was evidenced and reflected in the smaller amounts of stained areas on the filter papers, especially in the case of aerosols generated by an ultrasonic scaler (Fig. 7). The Shapiro-Wilk normality test demonstrated the non-parametric distribution of the data ($p < 0.0001$). A comparison with the Wilcoxon signed-rank test of the two procedures shows differences between both instruments, the stained area generated by the pneumatic scaler was greater than those produced by the ultrasonic scaler (Table 2).

The areas stained by the aerosols on the filter papers located near the assistant was more remarkable than those near the operator, patient, and dental unit when working in the upper sextant with a high-speed piece and triple syringe (Fig. 8a). Airflow through open window ventilation decreased the stained area for both instruments (Fig. 8b). The aerosols generated by the triple syringe were smaller than those produced by the high-speed piece, although they were mostly classified as droplet nuclei in both instances (Fig. 8c and 8d).

3.2 Characterization of aerosols produced in the AGPs

The four instruments evaluated generated a higher percentage of aerosols (size, 1–5 µm), regardless of the variables, instrument used, ventilation, distance from the oral cavity, location of the dental unit, and area of the mouth being treated (Table 3).

The aerosols were classified according to the settlement pattern on the surface. Patterns of different sizes and shapes were found, depending on the location of the paper from the mouth of the phantom, the instrument used, the angle of entry of the drops toward the surface of the paper, and the possibility of the formation of large drops formed by the union of several drops before their settlement by dripping through the gloves or hoses of the dental unit (Fig. 9).

3.3 Risk prediction scale

For the construction of the prediction model, the assumptions of normality, independence, and homoscedasticity were verified. Seven variables were used (Table 4), out of which five were selected (ventilation, distance, the instrument used, the area of the mouth being treated, and the location within the perimeter) to be included in the model, based on their association with the stained area outcome and the biological plausibility. For the distance variable, the cut-off point, according to the median value, was 78 cm from the mouth to the location of the filter paper. Similarly, the median was obtained as the cut-off point to dichotomize the stained area outcome variable (Table 5).

Five variables were finally included in the model using the Stepwise Forward method. Considering the more parsimonious model and with a higher coefficient of determination ($R^2 = 0.3368$), the ORs were estimated for each of the variables, as shown in Table 6. Based on the OR values of the risk of exposure to the aerosols, different scores were assigned to construct the scale, as shown in Table 7. These values were standardized to obtain a total value of 10 points.

The discrimination capacity of the model was evaluated using the ROC curve (Fig. 10). Additionally, the fit of the model was evaluated using the Hosmer Lemeshow test, which demonstrated good discrimination and adequate adjustment, as observed in Table 8. The observed and expected values were reported according to the predictive value obtained by the model for each of the scoring levels. The best cut-off point was five points, which showed adequate sensitivity and specificity (Table 9). In this scale, a probability of exposure to aerosols generated during dental procedures is assigned (Table 10).

3.4 Recommendations

The recommendations suggested based on the findings of the current study are shown in Figure 11. These recommendations complement those that were widely disseminated in previous reports [9, 10, 18, 19].

4. Discussion

The results of the present study provide evidence that aerosol generation is an imminent consequence of carrying out dental procedures and constitutes a potential mechanism for the spread of infection. The spread of aerosols during AGPs represents a significant risk of exposure, primarily for the dental staff. The variables that were associated with a higher risk of exposure in the prediction scale were as follows: a distance of less than 78 cm; improper ventilation; the use of a high-speed handpiece and pneumatic scalers (in periodontics); the location of the patient, operator, and assistant; and, to a lesser degree, the intervention of the anterior region of the mouth. The majority of the aerosols generated during the procedures presented with droplet sizes ranging from 1 to 5 µm. This size has been associated with severe health consequences because the droplets can penetrate the lower respiratory tract to establish infection [20].

The association of these variables should be put into the clinic context, considering the reported transmission routes of SARS-CoV-2, either by direct contact or by air transmission [9, 10]. The proximity between the patient –possibly infected–

and the dental staff determines a high risk of contagion depending on the adherence to the biosafety standards and personal protection elements recommended [8, 10, 13]. Particles of different sizes, mainly $<5\text{ }\mu\text{m}$ (86%) were produced. Some of them may settle down due to gravity, whereas some could remain suspended in the air and enter the respiratory tract [21]. The dispersion of expelled particles is not produced exclusively via airborne transmission or droplet mechanism, but by both methods simultaneously [13].

The permanence of these particles suspended in the air depends on the environmental conditions [22]. The infectious range depends mainly on the time interval between its presence in the atmosphere until its settlement [17]. Factors such as relative humidity, ambient temperature, and airflow have been closely related to the particle size and the time it takes to settle on a surface. During sample collection, conditions of 70% relative humidity and a temperature of 20°C , could favor the settlement of the aerosolized particles. Previous studies have shown that low relative humidity [23] and high ambient temperature [22] are related to a longer residence time of the droplet nuclei and droplets in the air [24]. The two environmental conditions mentioned increase the tendency of the drops to pass to the vapor phase, which tends to decrease their size by drying. This results in an increase in the mobility and circulation of the particles in the air [25] thereby increasing the risk of spreading the infection in the operation site [26].

Poor ventilation demonstrated a high association with the amount of stained area. This is consistent with previous reports, which estimated that better ventilation substantially reduces the suspension time of the aerosols in the air [27]. The positive influence of ventilation will depend on several conditions: first, on the amount of outdoor air that is available within the indoor space, defined as the ventilation rate; second, the direction of airflow from clean areas toward contaminated areas; and, finally, the distribution, which must cover all spaces while entering and leaving the clinical area [28]. These characteristics will depend on the infrastructure and layout of the area [29]. Although in this study, the experiments were carried out in six different clinical situations and twelve different dental unit locations, the extrapolation of the results should be done with caution, without neglecting the general vision of the clinical environment in which it will be applied [30].

The mass of the aerosol, as a possible important factor for the amount of viral load carried, determines the different settlement patterns with different possibilities of sizes and shapes of the droplets deposited on the surfaces [31]. Sedimented droplets may facilitate the transmission of infection by fomites [32]. Thick drops may be formed by splashes produced by the rebound of the pressurized water on some oral-dental structure or by the accumulation of oversized droplets on the operator's gloves or the patient's face and neck. Therefore, a mixture of aerosolized particles with particles that are not aerosols [13], which can contain saliva, blood, and microorganisms [32], might be formed. One must be vigilant about the adequate calibration of the water and air pressure in the dental unit and the maintenance of the hose system, where the instruments are connected to the unit. Furthermore, thick droplets may be formed by the phenomenon of coalescence or aggregation [13, 31], defined as a binary process in which two drops of the liquid merge to form a single drop. The factors that directly influence drop-drop interactions include Brownian motion, viscosity, density, interfacial contact area, diffusivity, surface tension, and concentration gradients; therefore, it is constituted as a phenomenon of the nature of the liquid [33-35].

As reported by Karimzadeh et al. [36], the SARS-CoV-2 viral load required to initiate COVID-19 disease may be less than 1,000 particles. In theory, taking into account the size of a viral particle that is in the range of $0.006\text{--}0.14\text{ }\mu\text{m}$ [37], a $1\text{ }\mu\text{m}$ drop could transport around eight viral particles. Hence, more than 120 drops ($1\text{ }\mu\text{m}$ or larger than $120\text{ }\mu\text{m}$ in size) may contain sufficient viral loads for infection. Of the 1256 samples obtained in the current study, 664 presented with stained areas $\geq 120\text{ }\mu\text{m}$, which makes transmission via generated aerosols biologically plausible during a dental procedure. However, other factors, such as the infectious capacity of the virions in the drops [20, 38], the inactivation potential of the virus, the saliva-water dilution ratio that varies between 1:20 to 1: 100 [13], the chemical composition of the drops, and the stability of their viability on different surfaces [39, 40] should be taken into account when evaluating the infectious potential of the aerosol.

The present study has two limitations. First, an in vivo model was not used to determine the amount of viable infectious virus in the aerosols and, second, the model used in this study was sensitive and could determine aerosols that have the capacity by size and weight to settle up to 30 min after the completion of the AGP [31, 41]. However, another model will be necessary to determine the amount and size of particles that remain suspended in the environment for a longer period.

Nonetheless, a significant contribution was made to the characterization of the size and settlement patterns of the aerosols generated by different instruments. More importantly, the broad need to maximize the biosecurity measures for the dental team and patient was demonstrated. The need to implement new clinical care strategies such as six-handed work to limit the traffic within the clinical area of non-team personnel during and after treatment ends, in addition to the exhaustive procedures that need to be performed as cleaning and disinfection measures of critical areas in a perimeter area of 200 cm in the vicinity of the patient's mouth and semi-critical areas up to 320 cm.

The proposed methodology was adequate to characterize the risk of exposure when performing the AGPs by using the aerosol contamination profiles. Furthermore, it helped to recognize the potential sources of contamination during a clinical procedure. It was possible to establish representative areas of environmental concentration of the aerosols that could be used as "level of action", for the adoption of preventive measures. The findings of this study will contribute to evaluating the effectiveness of ventilation or extraction systems, new techniques, and PPE kits proposed to improve the clinical practice.

The production of aerosols is only one risk factor in a dental context, where a network of interactions is woven to determine the dynamics of the virus transmission. The relevance of these findings is based on their practical utility because public health decisions have been made regarding the protocols for the care of patients in dentistry. They involve the use of protective equipment, the measures of prevention and disease transmission control strategies, cleaning and disinfection protocols, and the need to raise awareness in the community about the risk of infection. However, so far, quantitative estimates are being made on aerosol dispersion, which is the basis for the recommendations established by health regulators [39]. Hence, it is important to provide critical data to contribute to informed public health decision-making and the well-being of the population.

5. Conclusions

Under the limitations of the study, it can be concluded that the dispersion of aerosols represents a significant risk for the dental team, and it is advisable to take extreme biosecurity measures. The highest percentage of aerosols generated during the procedures ranged from 1 to 5 μm in size. The settlement patterns of the aerosols varied depending on the area surrounding the phantom head and the instrument used. Depending on the mass of the aerosol, they could be classified into fine and thick droplets with point, splatter, and spot patterns. The maximum range of the aerosols was 320 cm from the mouth of the phantom head with a cut-off point of 78 cm as a risk factor. The variables that influenced the production and scope of the aerosols were distance, ventilation, the instrument used, the location in the perimeter area, and the area of the mouth to be treated. Despite the presence of adequate barriers, the dental staff may be exposed to significant dissemination of the aerosolized particles. It is possible to apply a prediction scale to estimate the risk of exposure to the contagion, based on a model that included the most relevant variables of the clinical care conditions to foresee the need to maximize the use of the PPE and all the cleaning and disinfection measures. Implementing new clinical care strategies, such as a six-handed work to limit the traffic of non-team personnel within the clinical area during and after the treatment is imperative.

Declarations

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Compliance with Ethical Standards

Conflict of Interest: Paula A. Baldion declares that she has no conflict of interest. Camilo A. Guerrero declares that he has no conflict of interest. Alberto C. Cruz declares that he has no conflict of interest. Henry Oliveros, declares that he has no conflict of interest

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Ethical approval: Project approved by the ethics committee of the Facultad de Odontología, Universidad Nacional de Colombia (B-CIEFO-074-2020). This article does not contain any studies with human participants or animals performed by any of the authors. Informed consent: For this type of study, formal consent is not required.

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Availability of data and material: The datasets used and/or analyzed during the current study are available from Figshare, <https://doi.org/10.6084/m9.figshare.13049054>

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Tables

Table 1 Summary of the clinical procedures performed in the experiment

Dental Clínic	Procedure	Instrument	Time*
1 ^a	Full crown preparation on tooth # 8	Handpiece	12
	Class I cavity preparation in Tooth # 30	Handpiece	12
2 ^a	Full crown preparation on tooth # 8	Handpiece	12
	Class I cavity preparation in Tooth # 30	Handpiece	12
3 ^b	Veneer preparation on tooth # 8	Handpiece	12
	Endodontic Access Cavity in Tooth # 30	Handpiece	12
4 ^c	Scaling antero-mandibular sextant	Pneumatic scaler	15
	Scaling antero-mandibular sextant	Ultrasonic scaler	15
5 ^d	Full crown preparation on tooth # 8	Handpiece	12
	Full crown preparation on tooth # 30	Handpiece	12
6 ^e	Vestibular resin removal in upper anterior teeth	Handpiece	10
	Etch, rinse and dry in upper anterior teeth	Air-water syringe	5

^a General dentistry clinic; ^b Aesthetic Dentistry and Endodontics clinic; ^c Periodontics clinic; ^d Prosthodontics clinic; ^e Orthodontics clinic. *Time in minutes

Table 2 Comparative analysis between the pneumatic scaler and the ultrasonic scaler of the amount of stained area

Type of scaler	N	Min*	Max*	Median*	Rank*	Mean*	SD*	p value (<0,05)
Pneumatic	100	0	10.758	1,972	10.758	305,5	1294	0,0084
Ultrasonic	100	0	2.507	8.3 x 10 ⁻⁶	2.507	97,6	381,6	

*Stained area data in μm^2

Table 3 Types and sizes of settled aerosols

Type	Size	Number of drops*	Average of settlement**
Droplet nuclei	1 a 5 μm	0 - 93517	86 %
Droplets	5 a 10 μm	0 - 6668	5.2 %
Drops	>10 μm	0 - 18526	1. %

* Range of the number of drops found in the total filter papers located in the different positions.

** Mean settlement percentage with eight procedures performed in each one, according to the size of the drops in the six dental clinics.

Table 4 Association of independent variables

Variable	Condition of care	Frecuency	Valor de p
Division	With modular division between units	664	0.45
	Without modular division between units	552	
Dental unit	1 (close to the windows)	536	0.08
	2 (far from the windows)	720	
Tooth	Anterior	728	0.06
	Posterior	528	
Ventilation	Open	628	0.020
	Close	628	
Distance	> 78 cm	746	0.001
	< 78 cm	510	
Instrument	Dental handpiece	996	0.001
	Pneumatic Scaler	100	
	Ultrasonic Scaler	100	
	Triple syringe	100	
Filter paper location	Operator and patient	332	0.001
	Assistant	284	
	Dental equipment	128	
	Accessory surfaces	212	
	Adjacent surfaces	300	

Table 5 Cut points of greater discrimination in the associated variables

Variable	p25	p50	p75	Min. *	Max. *	Mean	SD	N
Distance	40	78	136	15	320	98	66	1256
Staining area	0	3,4	69	0	5'260.900	12.274	208.3	1256

*Value in μm^2 . The total area of the filter paper: 6'358,500 μm^2 . Max. staining area 82.7%.

Table 6 Prediction model of the risk of exposure to aerosols in dentistry

Variables	OR	IC 95%	Valor p
Tooth	1.1	(0.8 - 1.5)	0.4
Ventilation	1.5	(1.1 - 2.0)	0.001*
Distance	2.7	(1.8- 3.8)	0.001*
Instrument	1	1 Reference	0.001*
Filter paper location	1	1 Reference	0.001*
	2	1.3 (1.2- 3.5)	0.001*

* Statistically significant difference as a risk factor. Instrument 1 (Dental handpiece) and Filter paper location 1 (Operator and patient) were taken as basal level (Reference) with an OR = 1.

Table 7 Score of the variables according to the OR

Variable		OR	Score
Tooth	Anterior	1.1	1
Ventilation	Close	1.5	2
Distance	<78 cm	2.7	3
Instrument	Handpiece	1	1
Location	Operator y patient	1	1
	Assistent	1.3	2
Total		10	

Table 8 Scale validation in terms of discrimination and goodness of fit

Score	Prob	Obs 1	Exp 1	Obs 0	Exp 0	Total
1	0.0588	3	4.7	133	131.3	136
2	0.0943	18	10.3	114	121.7	132
3	0.1370	13	13.2	101	100.8	114
4	0.2665	26	24.0	96	98.0	122
5	0.4575	34	45.0	91	80.0	125
6	0.6291	71	71.6	57	56.4	128
7	0.7315	86	85.9	39	39.1	125
8	0.7953	88	93.8	35	29.2	123
9	0.8496	107	105.7	21	22.3	128
10	0.9261	116	107.6	6	14.4	122

Table 9 Sensitivity and specificity values of the scale

Classified + if predicted $\Pr(D) \geq 5$ True D defined as area = 0		
Sensitivity	$\Pr(+ D)$	80.96%
Specificity	$\Pr(- \sim D)$	78.64%
Positive predictive value	$\Pr(D +)$	75.46%
Negative predictive value	$\Pr(\sim D -)$	83.59%

Table 10 Prediction scale of the risk of exposure to aerosols in dentistry

Variable		Score
Tooth	Anterior	1
	Posterior	0
Ventilation	Open	0
	Close	2
Distance	<78 cm	3
	>78 cm	0
Instrument	Handpiece	1
	Other	0
Location	Operator y patient	1
	Assistant	2
Total		10